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REMARKS

A.   Allowable Subject Matter.

Applicants would like to thank the Examiner for indicating that claims 16-18 and 34-35 contain allowable subject matter.

B.   Request for Referenced Articles.

The Examiner was unable to locate the article titled "Distributed Simulation" from Aerospace Engineering, Nov. 2004 referenced by Applicants in their Amendment filed 1/17/06. It is respectfully submitted that this article was included as Exhibit D of the Declaration of Paul C. Krause that was filed with the Amendment of 1/17/06.

The Examiner was additionally unable to locate the article titled "Distributed Heterogeneous Simulation Laboratory" from Technology Horizons, Dec. 2005 referenced by Applicants in their Amendment filed 1/17/06. It is respectfully submitted that this article was included as Exhibit E of the Declaration of Paul C. Krause that was filed with the Amendment of 1/17/06.

C.   Rejections Under 35 U.S.C. §101.

Claims 1-13, 16-20, 24-26 and 29-42 were rejected under 35 U.S.C. §101 for allegedly lacking a "concrete, tangible and useful result" (Office Action, ¶¶14-21). Applicants respectfully traverse. Independent Claim 1 specifically recites "a second executing process that. . . implements a second continuous-time model to simulate a second physical subsystem. . . and outputs data representative of a state of the second continuous-time model." Claim 1 has further been amended herein to make it clear that both the first and second subsystems are "physical

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subsystems." The system of claim 1 therefore produces a concrete, tangible and useful result, namely data representing the state of a computer-simulated physical subsystem. It will be appreciated that this is directly analogous to the allowable result produced in the referenced State Street case (a computer-calculated price for one share of a mutual fund). Both the presently claimed invention and the system discussed in State Street use a computer to model a real world thing (physical subsystems or mutual funds), use mathematical operations to determine some descriptive aspect of that real-world thing (state of the physical subsystem or share price of the mutual fund), and then output this descriptive aspect. It is therefore believed that claim 1 is allowable under 35 U.S.C. §101.

Claims 2-8 and 29-33 depend from Claim 1 and therefore include all of the limitations of Claim 1. Applicants therefore respectfully submit that claims 2-8 and 29-33 are allowable under 35 U.S.C. §101 for at least the same reasons presented hereinabove with respect to Claim 1.

Independent Claim 9 specifically recites "simulating a second physical subsystem with a second continuous-time model. . . and outputting data representative of a state of the second continuous-time simulation." Claim 9 makes it clear that both the first and second subsystems are "physical subsystems." The system of claim 9 therefore produces a concrete, tangible and useful result, namely data representing the state of a computer-simulated physical subsystem. It will be appreciated that this is directly analogous to the allowable result produced in the referenced State Street case (a computer-calculated price for one share of a mutual fund). Both the presently claimed invention and the system discussed in State Street use a computer to model a real world thing (physical subsystems or mutual funds), use mathematical operations to determine some descriptive aspect of that real-world thing (state of the physical subsystem or

Amendment	Page 14 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

PAGE 17/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

share price of the mutual fund), and then output this descriptive aspect. It is therefore believed that claim 9 is allowable under 35 U.S.C. §101.

Claims 10-13, 16-20, 24-26 and 34-38 depend from Claim 9 and therefore include all of the limitations of Claim 9. Applicants therefore respectfully submit that claims 10-13, 16-20, 24-26 and 34-38 are allowable under 35 U.S.C. §101 for at least the same reasons presented hereinabove with respect to Claim 9.

Independent Claim 39 specifically recites "A computer-implemented system for simulating a physical system, the physical system comprising two or more subsystems. . . and the computing system provides an output signal from at least one of the subsystem simulations" Claim 39 makes it clear that the computer is modeling a "physical system." The system of claim 39 therefore produces a concrete, tangible and useful result, namely data representing the state of a computer-simulated physical subsystem. It will be appreciated that this is directly analogous to the allowable result produced in the referenced State Street case (a computer-calculated price for one share of a mutual fund). Both the presently claimed invention and the system discussed in State Street use a computer to model a real world thing (physical subsystems or mutual funds), use mathematical operations to determine some descriptive aspect of that real-world thing (state of the physical subsystem or share price of the mutual fund), and then output this descriptive aspect. It is therefore believed that claim 9 is allowable under 35 U.S.C. §101.

Claims 43 and 44 depend from Claim 39 and therefore include all of the limitations of Claim 39. Applicants therefore respectfully submit that claims 43 and 44 are allowable under 35 U.S.C. §101 for at least the same reasons presented hereinabove with respect to Claim 39.

Independent Claim 40 specifically recites "a continuous-time simulation of the physical system. . . outputting data representative of a state of the physical system." Claim 40 makes it

Amendment	Page 15 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

PAGE 18/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

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clear that the computer is modeling a "physical system." The system of claim 40 therefore

produces a concrete, tangible and useful result, namely data representing the state of a computer-

simulated physical system. It will be appreciated that this is directly analogous to the allowable

result produced in the referenced State Street case (a computer-calculated price for one share of

a mutual fund). Both the presently claimed invention and the system discussed in State Street

use a computer to model a real world thing (physical systems or mutual funds), use mathematical

operations to determine some descriptive aspect of that real-world thing (state of the physical

system or share price of the mutual fund), and then output this descriptive aspect. It is therefore

believed that claim 40 is allowable under 35 U.S.C. §101.

Claims 41 and 42 depend from Claim 40 and therefore include all of the limitations of

Claim 40. Applicants therefore respectfully submit that claims 41 and 42 are allowable under 35

U.S.C. §101 for at least the same reasons presented hereinabove with respect to Claim 40.

C.   Claims 1-13, 16-20, 24-26 and 29-38 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

The Office Action also rejected claims 1-13, 16-20, 24-26 and 29-38 under 35 U.S.C.

§112, first paragraph, as failing to comply with the enablement requirement. Specifically, the

Office Action alleges that the "claim(s) contains subject matter which was not described in the

specification in such a way as to enable one skilled in the art to which it pertains, or with which

it is most nearly connected, to make and/or use the invention. More specifically, the

specification does not describe how the invention implements the claimed limitation of a first

process (or subsystem) sending values (or messages) to a second process (or subsystem) without

the values or messages 'passing through a central communication process'." (Office Action ¶22-

24 (emphasis in original)).

Amendment	Page 16 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

PAGE 19/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

BEST AVAILABLE COPY

It is respectfully submitted that it is well established law that in the field of computer software, patent applicants may meet the enablement standard of 35 U.S.C. §112, first paragraph by providing a description of the functions that the software is intended to perform, it being considered within the skill of a person of ordinary skill in the art to write software code implementing those functions. "As a general rule, where software constitutes part of a best mode of carrying out an invention, description of such a best mode is satisfied by a disclosure of the functions of the software. This is because, normally, writing code for such software is within the skill of the art, not requiring undue experimentation, once its functions have been disclosed. It is well established that what is within the skill of the art need not be disclosed to satisfy the best mode requirement as long as that mode is described. Stating the functions of the best mode software satisfies that description test. We have so held previously and we so hold today." *Fonar Corp. v. General Electric Co.*, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997). "When the challenged subject matter is a computer program that implements a claimed device or method, enablement is determined from the viewpoint of a skilled programmer using the knowledge and skill with which such a person is charged. The amount of disclosure that will enable practice of an invention that utilizes a computer program may vary according to the nature of the invention, the role of the program in carrying it out, and the complexity of the contemplated programming, all from the viewpoint of the skilled programmer." *Northern Telecom Inc. v. Datapoint Corp.*, 15 USPQ2d 1321, 1329 (Fed. Cir. 1990). It is further respectfully submitted that passing data from one computer executing process to another is a very basic operation in the field of computer science, and as such no specific instruction on how to do this is required in Applicants' disclosure.

Amendment	Page 17 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

PAGE 20/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

BEST AVAILABLE COPY

Furthermore, and contrary to the assertion in the Office Action, the specification of the present application does discuss specifics of this communication. For example, Table 1 of the specification lists one embodiment of a function list to "allow the subsystem model implementation programmer to control the variables that are imported from and exported to other subsystem simulations." (specification, paragraph 0043). As further detailed in paragraph 0045, the "functions shown in Table 1 are provided in various forms to accommodate the various simulation environments that may be available within system 20. For example, the functions may be implemented in a dynamically linked library (.DLL), source code library, device driver, operating system API or other format as would occur to one skilled in the art and be acceptable given the constraints of its implementation environment."

As a further example, FIG. 7B blocks 351-359, in connection with the specification description at page 18, paragraph 0054, describes a message-handling loop for processing simulation control messages, specifically incoming connection requests from other models.

Applicants therefore respectfully submit that the application as filed provides adequate discussion regarding the sharing of information directly between processes as claimed herein and that Applicants have met the requirements of 35 U.S.C. §112, first paragraph. Applicants therefore respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, first paragraph.

Amendment	Page 18 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

PAGE 21/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

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D.   Claims 30-31 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

Specifically, the Office Action alleges that the specification does not teach the features of the "resistor companion model" claimed in Claim 30. Claim 30 has been canceled herein, therefore its rejection under 35 U.S.C. §112, first paragraph is considered to be moot.

The Office Action further alleges that the "numerical integration techniques" of Claim 31 are not taught in the specification. Applicants respectfully submit that the claimed numerical integration techniques are taught in the specification at paragraph 0076. Applicants therefore respectfully submit that the application as filed provides adequate discussion regarding numerical integration techniques as claimed herein and that Applicants have met the requirements of 35 U.S.C. §112, first paragraph. Applicants therefore respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, first paragraph as it applies to Claim 31.

E.   Claims 39-44 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

Specifically, the Office Action alleges that the specification does not teach the claim limitations of "a speed greater than $O(n)$ times the speed of the simulation using a single one of the computing devices", or for "$O(n^2)$" or "$O(n^3)$". Moreover, the Office Action alleges that "no evidence is presented that the claimed inventions actually meet these performance levels." (Office Action ¶33). It is respectfully submitted that the specification, as filed, teaches distributed simulation techniques that inherently result in the claimed speed increases. Contrary to the assertion of the Office Action, Applicants have presented evidence that the claimed invention meets these performance levels. In the article titled "Distributed Simulation" from

Amendment   Page 19 of 25   Inventors: Wasynczuk et al.
Application No. 09/884,528   Group Art Unit 2123   Attorney Docket No. 31122-8
                                   DISTRIBUTED SIMULATION

PAGE 22/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

BEST AVAILABLE COPY

Aerospace Engineering, Nov. 2004 that was included as Exhibit D of the Declaration of Paul C.

Krause that was filed with the Amendment of 1/17/06, a nearly 21-fold increase in speed is

reported using just three computers (Krause Declaration ¶13). The computer simulation package

used to achieve these speed increases corresponds to the presently claimed invention (Krause

Declaration ¶5).

It is therefore respectfully submitted that Applicants have submitted evidence that the

claimed invention achieves these speed increases, and that Claims 39-44 are therefore allowable

under 35 U.S.C. §112, first paragraph.

F.   **Claims 39-44 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.**

Specifically, the Office Action alleges that the "claims are indefinite because by claiming

a speed that is "$O(n^2)$ times the speed" or "$O(n^3)$ times the speed" of the prior art, it appears that

the Applicants are claiming an invention that is orders of magnitude slower than the prior art.".

(Office Action ¶35 (emphasis in original)). It is respectfully submitted that if two computers are

used in the simulation (n=2), then "$O(n^2)$ times the speed" indicates four times the speed

($n^2=2^2=4$) of using a single computing device. Similarly, "$O(n^3)$ times the speed" indicates eight

times the speed ($n^3=2^3=8$) of using a single computing device. Clearly, a speed increase over the

prior art is being claimed. It is therefore respectfully submitted that Claims 39-44 are therefore

allowable under 35 U.S.C. §112, second paragraph.

G.   **Claims 1-13, 19-20, 25-26, 29, 32-33 and 39-44 were rejected under 35 U.S.C. §103(a) as being unpatentable over DMSO Facility reference in view of OMG CORBA reference. Claims 24 and 36-38 were rejected under 35 U.S.C. §103(a) as being**

Amendment   Page 20 of 25   Inventors: Wasynczuk et al.
Application No. 09/884,528   Group Art Unit 2123   Attorney Docket No. 31122-8
                             DISTRIBUTED SIMULATION

PAGE 23/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

BEST AVAILABLE COPY

unpatentable over DMSO Facility reference in view of OMG CORBA reference and Official Notice.

The Examiner has relied upon OMG CORBA's Object Request Broker (ORB) as corresponding to a means for transmitting state-related numerical values between two simulation programs without passing through a central process. Support for this conclusion is based entirely upon the Office Action's unsupported assertion that "Examiner interprets that CORBA is decentralized, and therefore does not correspond to the claimed "central communication process." (Office Action ¶42) No support is given for this conclusory statement. Applicants respectfully point out that OMG CORBA's ORB is <u>not</u> a simulation process, therefore if all of the state-related numerical values passed between the simulation processes must pass through the ORB, then the ORB is a "central communication process" within the meaning of that term in Applicants' claims. As can be clearly seen in FIGs 1 and 2 of the OMG CORBA reference, all data on the system must pass through an ORB.

Furthermore, it is respectfully submitted that the OMG CORBA reference is <u>not prior art</u>. The OMG CORBA reference is dated November 12, 2004. The present application has a priority date of June 19, 2000. Therefore, the OMG CORBA reference is not available as prior art and its use in the present rejection under 35 U.S.C. §103 is improper.

For all of the above reasons, it is respectfully submitted that claims 1-13, 19-20, 24-26, 29, 32-33 and 36-44 are allowable under 35 U.S.C. §103.

H.   Declaration of Dr. Paul C. Krause.

Applicants, with their Amendment filed 01/17/06, submitted a Declaration of Dr. Paul C. Krause containing evidence of strong commercial success of a product corresponding to the present

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Amendment	Page 21 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

BEST AVAILABLE COPY

claims. This evidence was not considered by the Examiner. Instead, the Examiner simply stated "Examiner acknowledges Dr. Krause's Declaration, which provides evidence of commercial success. However, the claims are not currently in condition for allowance." (Office Action ¶63). It is respectfully submitted that evidence of commercial success of the claimed invention is relevant to rebut an obviousness rejection under 35 U.S.C. §103. Since the Office Action contained an obviousness rejection under 35 U.S.C. §103, it was improper for the Examiner to not consider such evidence. "[E]vidence on these secondary considerations is to be taken into account always" *Cable Elec. Prods., Inc. v. Genmark, Inc.*, 226 USPQ 881 (Fed. Cir. 1985). "Commercial success abroad, as well as in the United States, is relevant in resolving the issue of nonobviousness." *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984). For convenience, Applicants are re-presenting hereinbelow their original arguments relating to commercial success, and the Examiner is requested to consider same.

I.   **Evidence of Commercial Success of the Present Invention**

Applicants have established above that the present invention is not rendered obvious by the references relied upon in the Office Action. Applicants have also submitted (with the Amendment filed 01/17/06) evidence concerning objective indicia of non-obviousness. Accompanying that response was the Declaration of Dr. Paul C. Krause ("Krause"). This declaration demonstrates the commercial success of the invention and the risk of copying by competitors, and identifies the problems existing in the art that the invention solves.

As explained further in the declarations, P.C. Krause and Associates, Inc., owner of the present application, makes and sells products that correspond to the claims at issue (the "covered

Amendment	Page 22 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

BEST AVAILABLE COPY

products"). Krause, ¶¶ 4-5. The covered products have enjoyed outstanding commercial success. Krause, ¶¶ 6-10 and 17. In a market comprised of extremely technically sophisticated customers, see Krause, ¶ 11, the covered products have sold to some of the largest aerospace companies in the world. Krause, ¶ 7.

The covered products are purchased due to their superior performance over competing products. Krause, ¶ 11. Particularly, the covered products allow distributed simulation of physical systems to run on separate computers (or separate processes on the same computer) or in different languages. Krause, ¶ 5. The covered products allow an extremely large improvement in simulation speed as compared to other known techniques, see Krause, ¶¶ 5, 13 and 16, a result disclosed and claimed in the present application. An extremely sophisticated aerospace company has written an article detailing the large speed increase obtained using the covered products and describing them as "new" and "significant improvements." Krause, ¶ 13. These results were published in the prestigious technical journal *Aerospace* Engineering. Krause ¶ 13. Similarly, the Air Force Research Laboratory featured the covered product in their *Technology Horizons* magazine, reporting a 981-fold speed increase through the use of the covered product. Krause, ¶ 15. Air Force personnel reported in this magazine that use of the covered product allowed simulation "at a level of detail not before possible." Krause, ¶ 16.

The commercial success of the covered products is due to the structure and function claimed in the present application, not due to extrinsic sources such as advertising changes or escalation, reduction of prices or opening of new markets. Krause, ¶ 11.

Further, the covered products solve the simulation speed problems present in competing products and prior art references. Krause, ¶¶ 13, 16. The solution to these problems is found in the features disclosed and claimed in the present application. Krause, ¶ 5. Given the

Amendment	Page 23 of 25	Inventors: Wasynczuk et al.
Application No. 09/884,528	Group Art Unit 2123	Attorney Docket No. 31122-8
	DISTRIBUTED SIMULATION	

competitiveness of the market and the improved structure and function of the covered products, it is believed that the covered products would be copied if competitors were assured that no patent protection was available for the covered products. Krause, ¶ 19.

Consequently, there is substantial evidence of non-obviousness in the commercial success of the covered products, the problems it solves, and the risk of copying by competitors. The objective evidence presented herewith should be considered by the Examiner, and it is respectfully maintained that that evidence warrants a conclusion of non-obviousness in and of itself. Given the deficiencies of the cited references as well, it is believed that the claims of the present application are clearly allowable.

J.   PTO-892 Citation.

In the Office Action (¶64), the Examiner stated "In light of Dr. Krause's Declaration dated 1/20/06, Examiner has cited on the PTO-892 form a copy of the description of PCKA DHS product as described on the PCKA web site. The printout is dated 3/23/06." Applicant respectfully submits that the referenced description is not prior art. The present application has a priority date of June 19, 2000. Clarification from the Examiner on this point is respectfully requested.
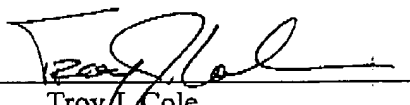
Amendment
Application No. 09/884,528

Page 24 of 25
Group Art Unit 2123
DISTRIBUTED SIMULATION

Inventors: Wasynczuk et al.
Attorney Docket No. 31122-8

PAGE 27/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24

CONCLUSION

For the foregoing reasons, Applicants submit that all claims are in a condition for allowance, and respectfully request a prompt Notice of Allowance for all pending claims. It should be understood that the above remarks are not intended to provide an exhaustive basis for patentability or concede the basis for the rejections and/or objections in the Office Action.

The original application included 5 independent and 37 total claims, and after the amendments above the application has 4 independent and 36 total claims, therefore no excess claim fees are believed to be due. The Commissioner is authorized to charge the two-month request for extension fee in the amount of $225.00 to the credit card detailed on the attached form PTO-2038. No additional fees are believed to be required with this Amendment; nevertheless, the Commissioner is hereby authorized to charge any fees due, including statutory fees for extensions of time, to Deposit Account No. 23-3030, but not to include any payment of issue fees.

Reconsideration of the present application, as amended, is respectfully requested. If there are any remaining issues that can be addressed telephonically, the Examiner is invited to contact the undersigned to discuss the same.

Respectfully submitted,

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Amendment   Page 25 of 25   Inventors: Wasynczuk et al.
Application No. 09/884,528   Group Art Unit 2123   Attorney Docket No. 31122-8
                                    DISTRIBUTED SIMULATION

PAGE 28/28 * RCVD AT 9/5/2006 4:38:16 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/14 * DNIS:2738300 * CSID:317 637 7561 * DURATION (mm-ss):08-24